

What is claimed is:

1. A gas-tightness diagnosing apparatus comprising:

a fuel tank;

an evaporative emission purge system having a canister, for temporarily adsorbing fuel  
5 vapors created in the fuel tank by the canister and for purging the fuel vapors from  
the canister to an air intake portion of an internal combustion engine under a  
predetermined engine operating condition;

a pressurizing device that raises an internal pressure in the fuel tank and in the  
evaporative emission purge system;

10 a pressure sensor that detects the internal pressure;

a diagnosing device that diagnoses a gas-tightness of the fuel tank and of the  
evaporative emission purge system based on a change in the internal pressure; and  
the pressurizing device being mounted in the fuel tank.

15 2. The gas-tightness diagnosing apparatus as claimed in claim 1, wherein:

the pressurizing device is mounted in a blistered portion of the fuel tank.

3. The gas-tightness diagnosing apparatus as claimed in claim 2, wherein:

the blistered portion, which accommodates therein the pressurizing device, is defined in  
20 either one of a side wall, an upper panel, and a bottom panel of the fuel tank.

4. The gas-tightness diagnosing apparatus as claimed in claim 1, wherein:

the pressurizing device comprises:

(i) an inlet pipe; and

25 (ii) an air pump mounted in the fuel tank and having an air outlet that is directly  
opened to an interior space of the fuel tank and an air inlet that is opened to an  
exterior space of the fuel tank through the inlet pipe, while defining a shorter axial  
length of a protruded portion of the inlet pipe, outwardly extending from an outer  
peripheral wall surface of the fuel tank.

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5. The gas-tightness diagnosing apparatus as claimed in claim 1, wherein:

the fuel tank is made of a resin tank formed with a blistered portion in which the pressurizing device is mounted, the blistered portion being dimensioned to fill a dead space defined around the fuel tank, while defining a larger volumetric capacity of the fuel tank.

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6. A gas-tightness diagnosing apparatus comprising:

a fuel tank;

10 evaporative emission purge means for capturing fuel vapors created in the fuel tank, for temporarily storing the fuel vapors and for purging the fuel vapors to an air intake portion of an internal combustion engine under a predetermined engine operating condition;

pressurizing means for raising an internal pressure in the fuel tank and in the evaporative emission purge means;

pressure sensing means for detecting the internal pressure;

15 diagnostic means for diagnosing a gas-tightness of the fuel tank and of the evaporative emission purge means based on a change in the internal pressure; and pressurizing means being mounted in the fuel tank.

7. A gas-tightness diagnosing apparatus comprising:

20 a sealed fuel tank that stores therein volatile fuel;

an evaporative emission purge system having a canister, for temporarily adsorbing fuel vapors created in the sealed fuel tank by the canister and for purging the fuel vapors from the canister to an air intake portion of an internal combustion engine under a predetermined engine operating condition;

25 a pressurizing device that raises an internal pressure in the sealed fuel tank and in the evaporative emission purge system under a condition that the evaporative emission purge system is cut off from the air intake portion;

a pressure sensor that detects the internal pressure;

30 a diagnosing device that diagnoses a gas-tightness of the sealed fuel tank and of the evaporative emission purge system based on a change in the internal pressure; and the pressurizing device being mounted in the sealed fuel tank.

8. The gas-tightness diagnosing apparatus as claimed in claim 7, wherein:  
the pressurizing device is mounted in a blistered portion of the sealed fuel tank.

9. The gas-tightness diagnosing apparatus as claimed in claim 8, wherein:  
5 the blistered portion, which accommodates therein the pressurizing device, is defined in  
either one of a side wall, an upper panel, and a bottom panel of the sealed fuel tank.

10. The gas-tightness diagnosing apparatus as claimed in claim 7, wherein:  
the pressurizing device comprises:

- 10 (i) an inlet pipe; and  
(ii) an air pump mounted in the sealed fuel tank and having an air outlet that is  
directly opened to an interior space of the sealed fuel tank and an air inlet that is  
opened to an exterior space of the sealed fuel tank through the inlet pipe, while  
defining a shorter axial length of a protruded portion of the inlet pipe, outwardly  
15 extending from an outer peripheral wall surface of the sealed fuel tank.

11. The gas-tightness diagnosing apparatus as claimed in claim 7, wherein:  
the sealed fuel tank is made of a resin tank formed with a blistered portion in which the  
pressurizing device is mounted, the blistered portion being dimensioned to fill a dead  
20 space defined around the sealed fuel tank, while defining a larger volumetric capacity  
of the sealed fuel tank.

12. A gas-tightness diagnosing apparatus comprising:

a sealed fuel tank that stores therein volatile fuel;

- 25 evaporative emission purge system having a canister, for temporarily adsorbing fuel  
vapors created in the sealed fuel tank by the canister and for purging the fuel vapors  
from the canister to an air intake portion of an internal combustion engine under a  
predetermined engine operating condition;

pressurizing means for raising an internal pressure in the sealed fuel tank and in the  
30 evaporative emission purge system under a condition that the evaporative emission  
purge system is cut off from the air intake portion;

pressure sensing means for detecting the internal pressure;

diagnostic means for diagnosing a gas-tightness of the sealed fuel tank and of the evaporative emission purge system based on a change in the internal pressure; and the pressurizing means being mounted in the sealed fuel tank.

5        13. A method of diagnosing a gas-tightness of a sealed fuel tank with an evaporative emission purge system including at least a canister, a fuel-tank vapor vent line interconnecting the canister and the sealed fuel tank, a purge line interconnecting the canister and an air intake portion of an internal combustion engine, a purge control valve disposed in the purge line, and an air induction valve, for temporarily adsorbing fuel  
10       vapors created in the sealed fuel tank by the canister and for purging the fuel vapors from the canister to the air intake portion under a predetermined engine operating condition, the method comprising:

             providing a pressurizing device in the sealed fuel tank;  
             determining whether the engine is operative or inoperative;  
15        pressurizing a predetermined gas-tightness diagnosing space, which is defined by internal spaces of the sealed fuel tank, the fuel-tank vapor vent line, the canister, and the purge line, by operating the pressurizing device provided in the sealed fuel tank, when the engine is inoperative;  
             detecting an internal pressure in the predetermined gas-tightness diagnosing space;  
20        determining whether the internal pressure is lower than a predetermined threshold value when a predetermined time period has expired from a starting point of the pressurizing device; and  
             diagnosing that the gas-tightness of the predetermined gas-tightness space is degraded when the internal pressure is lower than the predetermined threshold value for the  
25        predetermined time period.

             14. A method of diagnosing a gas-tightness of a sealed fuel tank with an evaporative emission purge system including at least a canister, a fuel-tank vapor vent line interconnecting the canister and the sealed fuel tank, a purge line interconnecting the  
30        canister and an air intake portion of an internal combustion engine, a purge control valve disposed in the purge line, and an air induction valve, for temporarily adsorbing fuel vapors created in the sealed fuel tank by the canister and for purging the fuel vapors from

the canister to the air intake portion under a predetermined engine operating condition, the method comprising:

providing a pressurizing device in the sealed fuel tank;

determining whether the engine is operative or inoperative;

5 fully closing both of the purge control valve and the air induction valve when the engine is inoperative, to define a predetermined gas-tightness diagnosing space defined by internal spaces of the sealed fuel tank, the fuel-tank vapor vent line, the canister, and the purge line, cut off from an exterior space with the purge control valve and the air induction valve both fully closed;

10 pressurizing the determined gas-tightness diagnosing space by operating the pressurizing device provided in the sealed fuel tank, under a condition that the evaporative emission purge system is cut off from the air intake portion;

detecting an internal pressure in the predetermined gas-tightness diagnosing space;

determining whether the internal pressure falls lower than a predetermined threshold

15 value when a predetermined time period has expired from a starting point of the pressurizing device; and

diagnosing that the gas-tightness of the predetermined gas-tightness space is degraded when the internal pressure falls lower than the predetermined threshold value for the predetermined time period.

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